

California's treetop dwelling rodent: The red vole

DFG photo © Ted Wooster

Searching for fir needle resin ducts on the damp forest floor may not be your idea of a good time, but to Department of Fish and Game (DFG) biologists reviewing timber harvest plans on the north coast,

By Rick Parmer

this is one sure fire way to find evidence of the elusive California red tree vole

(*Arborimus pomo*). These resin ducts from pine or fir needles look like tiny balls of hair and are often the only evidence of vole nests high above. The unconsumed ducts are "leftovers" from conifer needle "meals" that drop from these nests and distinguish vole inhabitants from squirrel or bird nests. Red tree voles nibble off these resin ducts to expose the edible



Above, red tree vole nest. Right, red tree vole with young.

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needle center and then eat them much like an ear of corn. Located along edges of conifer needles, resin ducts help to give trees more resistance to fungi that cause trees to rot.

Why have these diminutive tree-dwelling rodents become such a big deal to biologists and foresters? Due to their unique life history and highly specialized ecological niche, tree voles may become a more important indicator of overall forest health and changing climactic conditions in temperate coastal environments.

There are approximately 70 vole species worldwide, and these mouse-like rodents are related to the infamous lemmings. Vole distribution ranges from North America and Eurasia to North Africa. As far back as 1918, an article in the National Geographic asked why the tree vole (then called the rufus tree mouse) lived where it did. The question is still unanswered 81 years later. Scientists assume that some climactic event, change in food availability, or predator impacts triggered an evolutionary process that drove voles into the trees for survival.

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trees in humid areas from Sonoma County to the Oregon border and are on the California list of Species of Special Concern. Animals and plants of this classification are not yet listed as

threatened or endangered but are uncommon enough to warrant special attention.

Studying tree dwelling animals is a tough job for anyone, but Ted Wooster, a veteran DFG biologist from Yountville, and Pamela Town, a scientific aide from Willits, have studied these tiny rodents for the past several years. Wooster's principal field work on the endangered northern spotted owl naturally lead him to become curious about one of the owl's "dining" pleasures. Indeed, research has shown that the northern spotted owl is one of the main predators on the California red tree vole according to owl pellet analysis. Both owl and vole share habitats of Douglas fir, redwood, grand fir, and bishop pines in coastal areas with abundant fog and rain.

How do biologists study these nocturnal critters? They cannot be trapped like most ground mice. Instead, during daylight hours, once they find evidence of a nest on the forest floor, biologists must climb as high as 100 feet or more to determine if it is an active nest. Then one carefully checks the nest for signs of green conifer sprigs indicating current activity or inhabitants. Checking the nest



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is no simple feat. For the vole's size, nests can be surprisingly large, ranging up to three feet high and almost as wide. Where limbs allow sufficient support, they can go around the whole tree. Careful dismantling is essential to prevent nest damage. Females make nests usually in the whorl of limbs near the trunk or in dense foliage on outer branches. Nests are built with twigs and leftovers from eaten fir, pine, or spruce leaf spines. Some voles occupy old squirrel or bird nests and "remodel" them. Once a vole has been captured, it must be caged and secured for its trip down the tree.

The biologist can then weigh, measure, and

to food gathering and nest building activities. Though slow by nature, voles have incredible balance. Mature adults have been observed dropping almost 60 feet to the ground and landing on their feet uninjured.

To make vole surveying even more difficult, they are sporadically concentrated in their distribution rather than evenly distributed, and are found only in certain old growth conifers or trees of a certain size according to Wooster. A recent 18-acre plot Wooster is studying in

Breeding typically occurs from February through September but adults can produce litters at any time. In fact, females can even mate again within 24 hours of giving birth. To digest the rough cellulose needles, the weaned young must first eat the fecal matter of parents to accumulate the bacterial mix needed to break food down. Think of it like a sour dough bread "starter". The original starter (yeast) must be passed from batch to batch to achieve the unique sourdough bread result. The same is true of the bacterial

mix passed from one generation of voles to the next to ensure the ability to digest conifer needles is maintained. Though



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take necessary samples for later analysis. Unless, the vole specimen will be removed for captive study, someone must climb back up the tree and return it to its nest.

Tree vole nests are elaborate affairs. The exterior is often dome-like with an elaborate series of tunnels and chambers which varies from nest to nest. Remarkably clean, they do not urinate or defecate in their tunnels or sleeping chambers. Instead, there are "bathroom" chambers consisting of unused areas. The fecal material and discarded resin ducts eventually form a rather dense layer of substrate that helps cement the nest to the tree platform and create tunnel support. An escape tunnel is the only standard in every nest. It runs down to the base of the nest onto the trunk or branch. Top nest openings serve as access

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Mendocino County yielded 58 nests with an average tree age of 60 years. Similarly, in 1965, Chris Maser found 41 voles in 31 acres of a uniform 47-year-old douglas fir stand. Conventional scientific wisdom had been that vole nests were almost exclusive to old growth trees. Wooster's surveys indicate broader habitat adaptability. Oddly enough, Wooster has also found several nests in topped douglas fir trees under power lines. He theorizes that the foliage mat and splintering nature of these top "crops" may be especially conducive to vole habitation. These nests are not clumped in a group of trees as is more normal but dispersed rather widely along the power line right-of-way.

spotted owls also inhabit drier micro-climates, the red tree vole is thought to be limited to sites where consistent moisture keeps the needles moist. Just as redwood forests depend on the fog to transfer moisture from leaves to roots, studies have linked the abundance and distribution of voles to fog-rich coastal zones in dense temperate forests. Thus, they are observed to "drink" from the same needles that they eat in the relative safety of dense tree branches.

California red tree voles spend their life in one or a few nearby trees therefore the work of timber harvest review biologists is very important in identifying nests within harvest zones. Because voles are not listed as threatened or endangered, only species of special concern, these trees could be harvested under current laws. However,



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DFG biologists often recommend leaving nest trees in place if found. Since only about 3 percent of Timber Harvest plans were field inspected in 1998, the level of field knowledge of these critters is still limited. A \$3 million appropriation in the 1999/2000 state budget has increased DFG timber harvest inspections and, as a side benefit, will aid the identification and understanding of the red tree vole by trained biologists. Inhabited trees are often close to streams or creeks due to the higher ambient moisture in the air. The other nine California vole species are ground dwellers and live in burrows, tunnels, or debris piles. Most voles depend on nearby ground water sources for survival so ground dwelling cousins like the white-footed vole (another species of special concern) are more susceptible to predation from a variety of birds, mammals, and snakes.

What does a red tree vole look like close up? The coat is reddish brown to cinnamon and voles measure up to about 4.5 inches in length with a tail approximately half that long. It can easily fit in the palm of your hand and weighs less than two ounces. Unlike the quick scurrying behavior of most mice, tree

voles are slower and deliberate due to the precarious nature of their “high wire” existence. Their feet are wider and longer than the ground dwelling heather vole. Tails are longer and ears are smaller too. Claws are sharp and well curved for climbing and clinging. These adaptations help tree voles compete and survive in their unique living situation.

There is still much to be learned about tree voles. They remain difficult to study due to their nocturnal nature and relative scarcity. However, a more thorough understanding of the distribution, physiology, and habitat requirements can lead to science-based timber management practices that will maintain viable vole populations throughout their range. Appropriate protective measures will also ensure that these rodents continue to thrive and serve as a food source for the northern spotted owl.

It is suspected that fierce winter storms create population declines due to nest destruction and environmental hazards. Research is needed to determine the actual impact of storms relative to other factors like foliage moisture and predator abundance. Further research is also needed to determine how far a

population can expand from one place to another or how and when the weaned young move to other trees and establish nests.

Why is it important to continue to study this “lowly” rodent that has evolved in a specialized ecological niche of the coastal temperate forests? Like the Pacific yew tree that yielded the anti-cancer drug, taxol, understanding the vole’s unique and hardy physiology may someday hold the key to further human medical advances. Or, perhaps it will prove to be an important indicator species of the stability and health of coniferous forests on the northern California coast. Regardless of its human or ecological value, visitors who observe their large woody “tree” nests can marvel at the ability of this amazing animal to maintain its specialized existence since its evolution in the Pliocene era more than 2 million years ago. 🐿

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Ted Wooster is retiring after more than 36 years as a DFG biologist and photographer, and Jack White is a retired DFG information officer.